Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)


SSS02-17 Room:IC Time:May 25 15:15-15:30

# Estimation of sediment friction coefficient from heating upon APC penetration during the IODP NanTroSEIZE

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During the Nankai Trough Seismogenic Zone Experiments (NanTroSEIZE) of the Integrated Ocean Drilling Program (IOD), the advanced piston corer temperature (APCT) tool was used to determine in situ formation temperatures while piston coring down to ˜200 m below sea floor. When the corer is fired into the formation, temperature around the shoe abruptly increases due to the frictional heating. The temperature rise due to the frictional heat at the time of penetration is 10 K or larger. We found that the frictional temperature rise increase with increasing depth, and that its intersection at the seafloor seems non-zero.

Frictional heat energy, which is basically proportional to the temperature rise, is the product of the shooting length D and the shear stress (tau) between the pipe and the sediment. Assuming a coulomb slip regime, the shear stress is shows as: tau = tau0 + m∗(Sv-Pp), where tau0 is the cohesive stress, m the frictional coefficient between the pipe and the sediment, Sv the normal stress at the pipe, PP the pore pressure). This can explain the non-zero intersection as well as depth-dependent increase for the frictional heating observed in the APCT data. Assuming a hydrostatic state and by using the downhole bulk density data, we estimated the friction coefficient for each APC-T measurement. For comparison, we used the vane-shear strength measured on core samples to estimate the friction coefficients.

The frictional coefficients were estimated as ranging 0.01 ? 0.06, anomalously lower than expected for shallow marine sediments. They were lower than those estimated from vane-shear data, which range 0.05 to 0.2. Still, both estimates show a significant increase in the friction coefficient at Site C0012, which dominates in the hemipelagic sediment in the Shikoku Basin. The anomalously low values suggest either fluid injection between the pipe and the sediment during the measurement, uncertainty in converting the observed temperature rise to the frictional heat generation, etc. Further investigation is planned for other drillsites.

Keywords: IODP, NanTroSEIZE, APC-T, Friction coefficient